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Food Safety
and Inspection
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Office of Policy,
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Evaluation

Domestic Residue Data Book National Residue Program 1995

FOOD SAFETY AND INSPECTION SERVICE

DOMESTIC RESIDUE DATA BOOK

NATIONAL RESIDUE PROGRAM

1995

FOOD SAFETY AND INSPECTION SERVICE
1995 NATIONAL RESIDUE PROGRAM
DOMESTIC RESIDUE DATA BOOK

TABLE OF CONTENTS

INTRODUCTION

1995 DOMESTIC RESIDUE DATA BOOK

The Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) is responsible for ensuring that USDA-inspected meat and poultry products are safe, wholesome, free of adulterating residues, and accurately labeled. As part of this responsibility, FSIS conducts the National Residue Program (NRP) to help prevent the marketing of animals containing unacceptable (violative) residues from pesticides, animal drugs, or potentially hazardous chemicals. The NRP collects samples of meat and poultry products at domestic slaughter establishments under FSIS and State inspection authority. These samples are then analyzed for violative residue concentrations, either by one of the three FSIS technical service laboratories or by a laboratory under contract to FSIS. Violative residue concentrations are determined by reference to residue limits (tolerances or action levels) established by the Environmental Protection Agency (EPA) for pesticides and by the Food and Drug Administration (FDA) for animal drugs and environmental contaminants. It should be borne in mind that the multi-residue tests used in the program may detect some compounds that have tolerances but have little public health significance. See FSIS publication National Residue Program Plan [NRPP], 1995 edition.

The NRP activities reported here are of two types: monitoring and enforcement testing.

Monitoring

Monitoring involves the sampling of specified animal populations to provide information about the occurrence of residue violations on an annual, national basis. Compounds considered generally have established residue limits - tolerances or action levels. Residue limits pertinent to the 1995 NRP are listed in Appendix I.

Selection for monitoring is based on compound evaluations and the availability of laboratory methodology that is suitable for regulatory purposes. Monitoring information is obtained through a statistically-based random selection of specimens of normal-appearing tissues from passed carcasses. Generally, for a specific slaughter class/compound pair, the number of specimens chosen provides a 95% probability of detecting at least one violation when 1 percent of the animal population is violative (see Table on page 14). In addition to profile information, the results are used to identify producers or other entities marketing animals with violative concentrations of residues. When such producers subsequently offer animals for slaughter the animals may be subjected to enforcement testing until compliance is demonstrated.

Exceptions to the number of specimens selected are made for minor slaughter classes and for major slaughter classes in which problems are suspected; smaller sample sizes may be used in the former case, larger sample sizes in the latter.

The information generated from monitoring is reviewed periodically to assist in the allocation of Agency resources. A total of **38,047** monitoring sample units were analyzed during 1995 from all classes of food-producing animals.

Enforcement Testing

Enforcement testing consists of the analysis of specimens obtained from individual animals or lots based on clinical signs or herd history. Testing is performed to detect individual animals with violative concentrations of residues. It is emphasized in problem (high prevalence) populations and used as a tool to prevent residues from entering the food supply. Testing frequently results from decisions by program employees based on regional guidelines and direct observations. It is also used to follow up on producers and others who have been identified as marketing animals with violative concentrations of residues. A total of **368,110** enforcement testing samples were analyzed in 1995.

In-plant Tests

In-plant tests are a key part of the NRP. They provide a rapid screening method to detect the presence of residues at the plant level.

SOS, for Sulfa-On-Site, was implemented in April 1988 to test swine urine for sulfonamide residues. SOS is used in many of the largest swine slaughtering facilities. Laboratory confirmation of violations is required.

CAST, for Calf Antibiotic and Sulfonamide Test, is used to test bob veal calves (under 150 pounds and less than three weeks old). CAST does not require laboratory confirmation of the result; any violation found with CAST results in immediate condemnation of the calf.

STOP, for Swab Test on Premises, was implemented in 1979 to detect the presence of antibiotic residues in kidney tissue. Originally for testing dairy cows, it is now used for a number of slaughter classes. Laboratory confirmation is required before the animal carcass is condemned. Certain STOP-positive samples are tested for both antibiotics and sulfonamides; the sulfonamide violations are reported with the STOP antibiotic violations.

Confirmed STOP-positive sample specimens with sulfonamide residues that have no established limits are considered violative in those slaughter classes in which they are not approved for use.

FAST, for Fast Antimicrobial Screen Test, quickly detects both antibiotic and sulfonamide drug residues in kidneys and livers and has proved to be a suitable replacement for CAST and STOP. FAST was implemented in

pilot plants in 1995. FAST has been extended to some 50 of the largest slaughtering plants in 1996.

INTERPRETATION OF TABLES:

Sample Analyses/Violations

In the 1995 Residue Data Book, the main entries in the body of the table under compound or compound/class headings refer to analyses of sample units comprising tissues from an animal or several birds from the same production lot. The "Specific Violative Residues" presented in smaller type below the table refer to the actual residues found.

Within each compound class heading of the table, the reader is cautioned against equating total sample units that are violative (violations) with total violative residues. For example, tissue from one animal analyzed by the Chlorinated Hydrocarbons and Organophosphates screening method may contain two or more violative residues within this compound class.

It should also be noted that many sample tissues are analyzed for more than one compound or compound class and are reported here as separate analyses under each relevant compound heading. Each will be reported and included in total residue findings, even though occurring in the same animal.

In addition, analytical capabilities should be considered when interpreting residue levels and occurrences; see the 1995 edition of the NRPP, Section 3, "FSIS Residue Analytical Capability."

Aggregation of Data:

Care must be taken when making statistical inferences from these data. The domestic monitoring sampling program is designed to detect, with a predetermined level of confidence, specific compounds in the designated slaughter classes. The sampling program is not designed to provide an estimate of an overall national percentage of violations for all chemical residues and slaughter classes tested. The data on violations reported here should not be summed across either slaughter class or compound with the intent of arriving at a combined percentage to estimate a population value. This will not produce a statistically valid estimate for the population, given the sample design in use.

Confidence Intervals:

Within a slaughter class/compound pair, the results of the sampling may be considered as representative of that entire slaughter class population, since the sample selection

procedure is designed to approximate the selection of a simple random sample of animals. Hence, the percentage of violations in each pair is a statistically valid estimate of the corresponding slaughter class population percentage. Therefore, the information presented includes these estimates of percentage of violations, along with appropriate confidence intervals. The two-sided 95% confidence intervals for the population percentage of violations are given (i.e., the probability is approximately 95% that the interval ranging from the lower bound through the upper bound will contain the true population value). The confidence intervals were computed using the binomial distribution.

A Note on Calf Nomenclature

This edition follows the usage of the 1989 and later editions of the NRPP. "Fancy calves" in the 1988 edition became "Formula-fed calves" in 1989; "Western calves" in the 1988 edition became "Heavy calves" in 1989.

Non-violative Positive Results

Appendix II displays, for monitoring and enforcement testing (excludes In-plant tests), those laboratory-confirmed residues that are within established limits. The results include some Unidentified Microbial Inhibitors (UMI's), residues from antibacterial agents that are present but cannot be accurately identified.

Voluntary Inspection Program

A voluntary inspection and certification program is maintained for rabbits. Results from 1995 are presented in Appendix III.

RESULTS

1995 Summary

A low level of violative monitoring samples was detected in 1995, as has been found in previous sampling years. FSIS data indicate that the great majority of the 137.4 million head of livestock and 7.8 billion birds are free of violative residues when they are slaughtered in federally inspected plants.

In 1995 the FSIS monitoring program sampled and tested for seven classes of animal drug and pesticide compounds, comprising approximately 38 residues. Of the 38,047 monitoring analyses, 73 showed violative concentrations of residues. As noted earlier, the percent violative for all samples and all residues is not necessarily representative of the percent violative in the population as a whole. Sample percents can be considered representative only within a slaughter class/compound pair.

In 1995 monitoring, the following violations were found: 32 sulfonamides, 15 antibiotics, 14 chlorinated hydrocarbons and chlorinated organophosphates, six ivermectin, three levamisole, two arsenic, and one halofuginone.

The majority of these violations detected in monitoring were from illegal levels of approved animal drugs, particularly sulfonamide and antibiotic compounds used to prevent or treat bacterial infections. Most antibiotic and sulfonamide residue violations are confined to a relatively small percentage of livestock and poultry that make up the meat supply. The recurring reason for drug residue violations in livestock and poultry is failure to allow an adequate withdrawal time for the drugs to clear the animal's system. Detected illegal residues are usually concentrated in kidney, liver, or fat rather than muscle meat. NRP monitoring focuses on kidney and liver tissues, since most FDA limits are set in terms of these tissues.

Specific National Residue Program Compounds/Classes

Antibiotics

Fifteen antibiotic monitoring violations were found among 8,687 samples from all slaughter classes monitored for antibiotics.

CAST: 58,197 analyses were performed on bob veal calf samples in 1995, with 848 violative specimens. (65,059 CAST samples were tested in 1994, with 948 violative specimens.)

STOP: 83,524 analyses were performed on samples from horses, cattle, sheep/lambs, goats, swine, and ostriches in 1995, with 888 violations. (102,521 STOP samples were tested in 1994, with 1,046 violations.)

FAST: 68,139 analyses were performed in cattle in 1995, with 804 violations. (30,332 FAST samples in cattle in 1994 resulted in 255 violations.)

Sulfonamides

Thirty-two sulfonamide violations occurred among 8,435 samples from all slaughter classes monitored for sulfonamides. Non-formula fed calves accounted for six sulfa residue violations. Bob calves had five sulfa violations, sows had four, and goats three. Two sulfa violations each occurred in beef cows, steers, market hogs, boars/stags, and young chickens. One sulfa violation each was found among bulls, heavy calves, young turkeys, and ducks. The 32 sulfa violations included: 24 sulfamethazine, four sulfadimethoxine, three sulfathiazole, and one sulfaquinoxaline. SOS testing produced 43 violative samples of 155,430 analyses in 1995 (SOS testing produced 104 violative samples of 166,091 analyses in 1994.)

Arsenicals

Arsenical compounds are used in food-producing animals primarily as growth promoters and to prevent bacterial enteritis. Of the 1,323 monitoring samples of livestock and poultry, two violations were detected in young chickens.

Chlorinated Hydrocarbons & Organophosphates

These chemicals are effective insecticides. Some of these compounds - such as DDT - are no longer marketed because of their extremely long half-life. Fourteen violative analyses were found in sample specimens from horses, bulls, beef cows, sheep, goats, boars, and mature turkeys. Coumaphos accounted for six of the 14 violative residues; these were found in horses, bulls, and beef cows. Other pesticide violations were two chlordane, two PBB, one dieldrin, one DDT, one heptachlor, and one mirex.

Halofuginone

Halofuginone prevents coccidiosis, a serious and potentially fatal parasitic infection that spreads rapidly among chickens and turkeys. One violation was found in 470 young chickens; no violations were found in 322 young turkeys sampled in 1995.

Ivermectin

Ivermectin is one of the most widely-sold anthelmintic drugs in the United States. It is active against a wide variety of parasites. Six of 3,847 samples in 1995 monitoring were violative: three in sheep, one in bulls, one in dairy cows, and one in goats. No violations were found among samples from ten other production classes.

Levamisole

Levamisole is a broad-spectrum anthelmintic that is active against the mature stages of the major gastrointestinal helminths and against mature and immature lung worms. It is approved for use in swine, non-lactating dairy cattle, and beef cattle. Withdrawal times vary from two to 19 days before slaughter depending on the slaughter class and dosage regimen. Of the 4,499 samples tested in the 1995 monitoring program, two violations were found in mature sheep and one violation was found in a lamb.

Address for Comments:

The domestic residue sampling programs and its results were designed and compiled by the Residue Staff in the Science and Technology Program. Technical comments/questions about the residue program should be referred to the **Inspection Methods Development Division.** The telephone number is 202-720-3219.

Current address is:
FSIS, Office of Policy, Program Development, and Evaluation
Inspection Methods Development Division
300 12th Street, SW, 202 Annex
Washington, D.C. 20250

Acknowledgments:

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CORRECTIONS TO:

"DOMESTIC RESIDUE DATA BOOK
NATIONAL RESIDUE PROGRAM
1995"

Please note the following changes in the "Address for Comments" section, page vii:

1. Technical comments/questions about the residue program should be referred to the EMERGING ISSUES BRANCH, CHEMISTRY AND TOXICOLOGY DIVISION, OFFICE OF PUBLIC HEALTH AND SCIENCE.
   The telephone number is 202-501-7319.

2. Current address is:
   Emerging Issues Branch
   Chemistry and Toxicology Division
   Office of Public Health and Science
   Food Safety and Inspection Service
   U.S. Department of Agriculture
   6912 Franklin Court Offices
   1400 Independence Avenue
   Washington, DC 20250

1995 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS

Chlortetracycline
Erythromycin
Gentamicin
Neomycin
Oxytetracycline
Penicillins
Streptomycin
Tetracycline
Tylosin

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Bulls	377/0	0	0.0-1.0	
Beef cows	530/0	0	0.0-0.7	
Dairy cows	509/1	0.2	0.0-1.1	
Heifers	288/0	0	0.0-1.3	
Steers	300/0	0	0.0-1.2	
Bob calves	479/1	0.2	0.1-1.2	
Formula-fed calves	514/4	0.8	0.2-2.0	
Non-formula calves	404/1	0.2	0.0-1.4	
Heavy calves	450/0	0	0.0-0.8	
Cattle				390/11
Sheep	447/0	0	0.0-0.8	
Lambs	583/1	0.2	0.0-1.0	
Sheep/Lambs				78/1
Goats	279/0	0	0.0-1.3	
Market hogs	325/2	0.6	0.1-2.2	
Boars/Stags	394/0	0	0.0-0.9	
Sows	521/2	0.4	0.0-1.4	
Swine				236/0

1995 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Young chickens	494/0	0	0.0-0.7	
Mature chickens	527/0	0	0.0-0.7	
Chickens				10/0
Young turkeys	502/1	0.2	0.0-1.1	
Mature turkeys	232/0	0	0.0-1.6	
Turkeys				21/0
Ducks	500/2	0.4	0.0-1.4	11/0
Geese	32/0	0	0.0-10.9	

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Dairy cows: 1 gentamicin
Bob calves: 1 neomycin, 1 tetracycline
Formula-fed calves: 3 penicillin, 1 tetracycline
Non-formula calves: 1 penicillin
Lambs: 1 oxytetracycline
Market hogs: 2 tetracycline
Sows: 2 penicillin
Young turkeys: 1 chlortetracycline
Ducks: 1 penicillin, 1 streptomycin, 1 chlortetracycline

Enforcement Testing:

Cattle: 3 oxytetracycline, 4 penicillin, 1 gentamicin, 1 neomycin, 1 chlortetracycline, 1 tetracycline
Sheep/Lambs: 1 tetracycline

In-plant Tests	Enforcement Testing: Analyses/Violations
Calf Antibiotic and Sulfonamide Test **(CAST)**	58,197/848

1995 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

In-plant Tests	Enforcement Testing: Analyses/Violations
Swab Test On Premises **(STOP)** [Includes samples tested for sulfonamides]	
Horses	318/8
Cattle	77,083/851
Sheep/Lambs	672/2
Goats	144/0
Swine	5,155/27
Ostriches	152/0
TOTAL STOP	83,524/888

STOP SPECIFIC VIOLATIVE RESIDUES

Horses: 8 penicillin
Cattle: 342 penicillin, 158 oxytetracycline, 74 tetracycline, 55 gentamicin, 48 sulfadimethoxine, 45 streptomycin, 42 sulfamethazine, 35 chlortetracycline, 25 erythromycin, 24 neomycin, 1 sulfathiazole, 1 tylosin
Sheep/Lambs: 1 tetracycline, 1 penicillin, 1 sulfamethazine
Swine: 13 penicillin, 9 tetracycline, 2 chlortetracycline, 2 oxytetracycline, 1 streptomycin

Fast Antimicrobial Screen Test **(FAST)** [Includes samples tested for sulfonamides also]	
Cattle	68,139/804
Swine	544/5
Sheep/Lambs	21/0

FAST SPECIFIC VIOLATIVE RESIDUES

Cattle: 206 penicillin, 144 oxytetracycline, 127 neomycin, 76 gentamicin, 70 tetracycline, 72 sulfadimethoxine, 45 streptomycin, 26 sulfamethazine, 12 chlortetracycline, 11 erythromycin, 13 sulfamethoxazole, 2 sulfachlorpyridazine
Swine: 4 oxytetracycline, 1 penicillin

1995 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES

Sulfachlorpyridazine
Sulfadimethoxine
Sulfamethazine
Sulfathiazole

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Bulls	374/1	0.3	0.0-1.5	
Beef cows	517/2	0.4	0.0-1.4	
Dairy cows	478/0	0	0.0-0.8	
Heifers	359/0	0	0.0-1.0	
Steers	324/2	0.6	0.1-2.2	
Bob calves	547/5	0.9	0.3-2.1	
Formula-fed calves	526/0	0	0.0-0.7	
Non-formula calves	418/6	1.4	0.5-3.1	
Heavy calves	463/1	0.2	0.0-1.2	
Cattle				49/4
Sheep	274/0	0	0.0-1.3	
Lambs	352/0	0	0.0-1.0	
Sheep/Lambs				12/0
Goats	280/3	1.1	0.2-3.1	
Market hogs	310/2	0.6	0.1-2.3	
Boars/Stags	377/2	0.5	0.1-1.9	
Sows	514/4	0.8	0.2-2.0	
Swine				66/3
Young chickens	482/2	0.4	0.0-1.5	

1995 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Mature chickens	518/0	0	0.0-0.7	
Chickens				14/0
Young turkeys	530/1	0.2	0.0-1.0	
Mature turkeys	231/0	0	0.0-1.6	
Turkeys				32/2
Ducks	530/1	0.2	0.0-1.0	1/0
Geese	31/0	0	0.0-11.2	

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Bulls: 1 sulfamethazine
Beef cows: 1 sulfamethazine, 1 sulfathiazole
Steers: 2 sulfamethazine
Bob calves: 4 sulfamethazine, 1 sulfathiazole
Non-formula calves: 4 sulfamethazine, 1 sulfachlorpyridazine, 1 sulfadimethoxine, 1 sulfathiazole
Heavy calves: 1 sulfamethazine
Goats: 2 sulfamethazine, 1 sulfadimethoxine
Market hogs: 2 sulfamethazine
Boars/Stags: 2 sulfamethazine
Sows: 4 sulfamethazine
Young chickens: 1 sulfadimethoxine, 1 sulfaquinoxaline
Young turkeys: 1 sulfadimethoxine
Ducks: 1 sulfamethazine

Enforcement Testing:

Cattle: 2 sulfamethazine, 2 sulfadimethoxine
Swine: 3 sulfamethazine
Turkeys: 2 sulfadimethoxine

SULFONAMIDES, continued

SULFA-ON-SITE (SOS)	Enforcement Testing: Analyses/Violations
Swine	155,430/43

All residues are of sulfamethazine in muscle tissue.

ARSENIC

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses				2/0
Market hogs	112/0	0	0.0-3.2	
Boars/Stags	72/0	0	0.0-5.0	
Sows	103/0	0	0.0-3.5	
Young chickens	488/2	0.4	0.0-1.5	
Mature chickens	113/0	0	0.0-3.2	
Chickens				23/0
Young turkeys	310/0	0	0.0-1.2	
Mature turkeys	36/0	0	0.0-9.7	
Turkeys				24/0
Ducks	89/0	0	0.0-4.1	

1995 DOMESTIC RESIDUE PROGRAM RESULTS

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Aldrin
Benzene Hexachloride (BHC)
Carbophenothion (trithion)
Chlordane (technical)
2-Chloro-1(2,4,-dichlorophenyl)vinyl diethyl phosphate [chlorfenvinphos, supona]
2-Chloro-2,4,5 trichlorophenyl)vinyl dimethyl phosphate [stirofos, gardona]
Chlorpyrifos
Coumaphos and oxygen analog
DDT and metabolites
Dieldrin
Dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta(cd)pentalene [mirex]
Endosulfan
Endrin
Heptachlor and heptachlor epoxide
Hexachlorobenzene (HCB)
Lindane
Linuron
Methoxychlor
Phosalone
Polybrominated biphenyls
Polychlorinated biphenyls

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses	507/5	1.0	0.3-2.3	180/0
Bulls	578/1	0.2	0.0-1.0	
Beef cows	520/3	0.6	0.1-1.7	
Dairy cows	522/0	0	0.0-0.7	
Heifers	569/0	0	0.0-0.6	
Steers	526/0	0	0.0-0.7	
Bob calves	501/0	0	0.0-0.7	
Formula-fed calves	521/0	0	0.0-0.7	
Non-formula calves	410/0	0	0.0-0.9	
Heavy calves	453/0	0	0.0-0.8	
Cattle				736/1
Sheep	453/1	0.2	0.0-1.2	
Lambs	600/0	0	0.0-0.6	

1995 DOMESTIC RESIDUE PROGRAM RESULTS

CHC/COP'S, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Sheep/Lambs				5/0
Goats	465/2	0.4	0.1-1.5	33/0
Market hogs	524/0	0	0.0-0.7	
Boars/Stags	411/1	0.2	0.0-1.3	
Sows	549/0	0	0.0-0.7	
Swine				103/0
Young chickens	487/0	0	0.0-0.8	
Mature chickens	536/0	0	0.0-0.7	
Chickens				110/0
Young turkeys	528/0	0	0.0-0.7	
Mature turkeys	266/1	0.4	0.0-2.1	
Turkeys				8/0
Ducks	505/0	0	0.0-0.7	
Geese	33/0	0	0.0-10.6	

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Horses: 4 coumaphos, 1 heptachlor
Bulls: 1 coumaphos
Beef cows: 1 coumaphos, 1 DDT, 1 dieldrin
Sheep: 1 chlordane
Goats: 1 chlordane, 1 PBB
Boars/stags: 1 PBB
Mature turkeys: 1 mirex

Enforcement Testing:

Cattle: 1 hexachorobenzene

1995 DOMESTIC RESIDUE PROGRAM RESULTS

HALOFUGINONE

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Young chickens	470/1	0.2	0.0-1.2	17/0
Young turkeys	322/0	0	0.0-1.1	

IVERMECTIN

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Bulls	365/1	0.3	0.0-1.5	
Beef cows	316/0	0	0.0-1.2	
Dairy cows	328/1	0.3	0.0-1.7	
Heifers	320/0	0	0.0-1.1	
Steers	512/0	0	0.0-0.7	
Formula-fed calves	221/0	0	0.0-1.7	
Non-formula calves	180/0	0	0.0-2.0	
Heavy calves	445/0	0	0.0-0.8	
Cattle				28/1
Sheep	449/3	0.7	0.1-1.9	

IVERMECTIN, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Lambs	210/0	0	0.0-1.7	
Sheep/Lambs				15/0
Goats	212/1	0.5	0.0-2.6	30/0
Market hogs	113/0	0	0.0-3.2	
Boars/Stags	72/0	0	0.0-5.0	
Sows	104/0	0	0.0-3.5	
Swine				1/0

LEVAMISOLE

(Non-violative positives are reported in Appendix II)

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Bulls	349/0	0	0.0-1.1	
Beef cows	311/0	0	0.0-1.2	
Dairy cows	292/0	0	0.0-1.3	
Heifers	318/0	0	0.0-1.2	
Steers	309/0	0	0.0-1.2	
Formula-fed calves	321/0	0	0.0-1.1	

LEVAMISOLE, continued

Slaughter Class	Monitoring:			Enforcement Testing:
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Non-formula calves	252/0	0	0.0-1.5	
Heavy calves	273/0	0	0.0-1.3	
Sheep	430/2	0.5	0.1-1.7	
Lambs	347/1	0.3	0.0-1.6	
Sheep/Lambs				20/0
Goats	277/0	0	0.0-1.3	
Market hogs	476/0	0	0.0-0.8	
Boars/Stags	232/0	0	0.0-1.6	
Sows	312/0	0	0.0-1.2	

1995 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTAL

Slaughter Class	Monitoring: Analyses	Enforcement Testing: Analyses
Horses	507	180
Bulls	2,043	
Beef cows	2,194	
Dairy cows	2,129	
Heifers	1,854	
Steers	1,971	
Bob calves	1,527	
Formula-fed calves	2,103	
Non-formula calves	1,664	
Heavy calves	2,084	
Cattle		1,203
Sheep	2,053	
Lambs	2,092	
Sheep/Lambs		130
Goats	1,513	63
Market hogs	1,860	
Boars/Stags	1,558	
Sows	2,103	
Swine		406
Young chickens	2,421	
Mature chickens	1,694	
Chickens		174
Young turkeys	2,192	
Mature turkeys	765	

1995 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTAL, continued

Slaughter Class	Monitoring: Analyses	Enforcement Testing: Analyses
Turkeys		85
Ducks	1,624	
Geese	96	
TOTAL	**38,047**	**2,241**

CUMULATIVE TOTAL

Compound Class	Monitoring: Analyses	Enforcement Testing: Analyses
Antibiotics	8,687	211,171[1]
Sulfonamides	8,435	155,604[2]
Arsenic	1,323	49
CHC/COP's	10,464	1,175
Halofuginone	792	17
Ivermectin	3,847	74
Levamisole	4,499	20
TOTAL	**38,047**	**368,110**

[1]. Includes CAST, FAST, and STOP data.
[2]. Includes SOS data.

STATISTICAL TABLE: NUMBER OF SAMPLES REQUIRED TO ENSURE DETECTION OF A PROBLEM THAT AFFECTS A GIVEN PERCENTAGE OF THE SAMPLED POPULATION

Percentage Violative in Sampled Population	Probability of Detection (Percent)			
	90	95	99	99.9
	Samples Required			
10	22	29	44	66
5	45	59	90	135
1	230	299	459	688
0.5	460	598	919	1,379
0.1	2,302	2,995	4,603	6,905
0.05	4,605	5,990	9,209	13,813

APPENDIX I

RESIDUE LIMITS FOR COMPOUNDS INCLUDED IN THE 1995 DOMESTIC RESIDUE PROGRAM

APPENDIX I: 1995 RESIDUE LIMITS

This section provides information on residue limits in meat and poultry products applied by FSIS (as of July 1, 1995). These limits include tolerances and action levels developed by the Environmental Protection Agency (EPA) for pesticide chemicals, and by the Food and Drug Administration (FDA) for animal drugs and unavoidable contaminants. These limits are derived in most cases from the Code of Federal Regulations (CFR): pesticide limits from 40 CFR 180, those for animal drugs from 21 CFR 556, and unavoidable contaminants from 21 CFR 109. The approved use conditions for animal drugs can be found in 21 CFR 520, 522, 524, 526, 529 (new animal drugs not subject to certification), 540, 544, 546, 548 (antibiotic drugs for use with animals), and 558 (new animal drugs for use in animal feed).

Formal tolerances are not established in all cases. For example, tolerance exemptions have been granted by EPA and FDA in approving the use of some pesticides and new animal drugs. For some unavoidable contamination situations, EPA and FDA, upon request, recommend action levels to FSIS; however, tolerances or action levels have not been established for all such situations. FSIS permits concentrations of residues in meat and poultry that do not exceed the residue limits published in this section.

The residue limits for poultry and livestock species are listed alphabetically by compound (which may include a compound's metabolites). The entries include, among other things, CFR or Federal Register (FR) citations for tolerances, and notations of action levels. Entries for animal drugs with "zero" or "no residue" tolerances also include, in parenthesis, the limits of quantification determined by FSIS in applying the pertinent method. These limits are used by FDA for enforcement purposes, and are applied by FSIS in determining if product is adulterated.

Any residue of a new animal drug found in the edible tissues of a species for which the drug is not approved will be considered an adulterant, provided the residue is found at a concentration that can be quantified and confirmed by a validated analytical method. A concentration of a substance endogenous in the animal tissue in question would not be considered an adulterant.

Unless otherwise indicated, "meat byproducts" includes kidney and liver.

APPENDIX I: 1995 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry
ANTIBIOTICS					
Chlortetracycline	21 CFR 556.150	0.0F[1] 0.1K[1] 0.1L[1] 0.1M[1]	- 1K[2] 0.5L[2] 0.1M[2]	0.2F 4K 2L 1M	- 4K 1L 1M, 1S
Erythromycin	21 CFR 556.230	0.1Et	-	0.1Et	0.125Et
Gentamicin	21 CFR 556.300	-	-	0.4F 0.4K 0.3L 0.1M	0.1Et[3]
Neomycin	21 CFR 556.430 21 CFR 522.1484 21 CFR 524.1484	0.25Et[4] 1.00F[5] 0.75K[5] 0.50L[5] 0.25M[5]	- 1.25F[5] 1.25K[5] 1.25L[5] 0.25M[5]	- 1.00F[5] 1.00K[5] 0.75L[5] 0.25M[5]	- 0.50F[5] 1.00K[5] 0.75L[5] 0.25M[5]
Oxytetracycline	21 CFR 556.500 21 FR 42855	0.1Et	0.1 Et[2]	0.1Et	1F 3K 1L 1M, 1S
Penicillin	21 CFR 556.510	0.05Et	0(0.04)Et[6]	0(0.04)Et[6]	0(0.04)Et[6,7]
Streptomycins	21 CFR 556.200 21 CFR 556.610	2K 0.5Et	-	2K 0.5Et	2K 0.5Et

1 Cattle only; calves 1F, 4K, 4L, 1M.
2 Sheep only.
3 Turkeys only.
4 Calves only.
5 Action level (letter from J. Taylor of FDA to L. Crawford of FSIS, January 26, 1988).
6 Numbers in parenthesis are minimum levels of detection.
7 Chickens, pheasants, and quail; turkeys 0.01 Et; ducks and geese 0.01Et (action level).

KEY

Ek: Excluding Kidneys
Et: Edible tissue
F: Fat
K: Kidney
L: Liver
M: Muscle
Mb: Meat byproducts
S: Skin
Sf: Skin with fat
Sm: Skeletal muscle

APPENDIX I: 1995 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry
ANTIBIOTICS, continued					
Tetracycline	21 CFR 556.720	0.25Et[1]	0.25Et[2]	0.25Et	0.25Et
Tylosin	21 CFR 556.740	0.2F 0.2K 0.2L 0.2M	-	0.2F 0.2K 0.2L 0.2M	0.2F 0.2K 0.2L 0.2M
SULFONAMIDES					
Sulfachlorpyridazine	21 CFR 556.630	0.1Et[1]	-	0.1Et	-
Sulfadimethoxine	21 CFR 556.640	0.1Et	-	-	0.1Et
Sulfaethoxypyridazine	21 CFR 556.650	0.1Et	-	(0.1)Et [3]	-
Sulfamethazine	21 CFR 556.670	0.1Et	-	0.1Et	0.1Et [4]
Sulfathiazole	21 CFR 556.690	-	-	0.1Et	-
ARSENICALS	21 CFR 556.60 40 CFR 180.311	0.7F [5] 1.4K [5] 1.4L [5] 0.7M [5] 0.7Mb [5]	-	2K 2L 0.5M 0.5Mb	0.5M 2Mb

1 Calves only.
2 Sheep only
3 Numbers in parenthesis are minimum levels of detection.
4 Chickens and turkeys.
5 Cacodylic acid (as AS_2O_3)

KEY

EK: Excluding kidneys
Et: Edible tissue
F: Fat
K: Kidney
L: Liver
M: Muscle
Mb: Meat byproducts
S: Skin
Sf: Skin with fat
Sm: Skeletal muscle

APPENDIX I: 1995 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)						
Aldrin[1]	51 FR 46662	0.3F	0.3F	0.3F	0.3F	0.3F
Benzene Hexachloride[1] (BHC)	51 FR 25697	0.3F	0.3F	0.3F	0.3F	0.3F
Chlordane[2]	51 FR 46665	0.3F	0.3F	0.3F	0.3F	0.3F
2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate [chlorfenvinphos]	40 CFR 180.322	0.2F	0.2F[3]	0.005F	0.005F	0.005F
2-Chloro-1-(2,4,5-tri-chlorophenyl)vinyl diethyl phosphate [stirofos]	40 CFR 180.252	1.5F	0.5F	1.5F	0.75F	0.5F
Chlorpyrifos and metabolite	40 CFR 180.342 58 FR 19356	0.3F 0.05M 0.05Mb	0.2F 0.05M 0.05Mb	0.2F 0.05M 0.5Mb	0.1F 0.1M 0.1Mb	0.25F 0.25M 0.25Mb
Coumaphos and oxygen analog	40 CFR 180.189	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb
DDT and metabolites[1]	51 FR 46658	5F	5F	5F	5F	5F
Dieldrin[1]	51 FR 46662	0.3F	0.3F	0.3F	0.3F	0.3F

1 Action level.
2 Action level; includes sum of residues of cis- and trans-chlordane, cis- and trans-nonachlor, oxychlordane (octachlor epoxide), and alpha, beta, and gamma chlordene.
3 Sheep only; goats 0.005F.

KEY

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F: Fat
K: Kidney
L: Liver
M: Muscle
Mb: Meat byproducts
S: Skin
Sf: Skin with fat
Sm: Skeletal muscle

APPENDIX I: 1995 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
CHC/COP'S, continued						
Dodecachloroocta-[1] hydro-1,3,4-metheno- 2H-cyclo-buta(cd) pentalene [Mirex]	51 FR 45114	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Endosulfan and metabolite	40 CFR 180.182	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	-	0.2F 0.2M 0.2Mb
Hexachlorobenzene[1] (HCB)	MPI Dir 917.1	0.5F	0.5F	0.5F	0.5F	0.5F
Heptachlor and[1] heptachlor epoxide	54 FR 33690 MPI Dir 917.1	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb
Lindane	40 CFR 180.133 MPI Dir 917.1	7F	7F	4F	4F[1]	7F
Linuron	40 CFR 180.184	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	-	1F 1M 1Mb
Methoxychlor	40 CFR 180.120 MPI Dir. 917.1	3F	3F	3F	3F[1]	3F
Polychlorinated biphenyls (PCB's)[2]	21 CFR 109.30 46FR 39224	3F[1]	3F[1]	3F[1]	3F	3F[1]

1 Action level.
2 The temporary tolerance for unavoidable residues of PCB's in infant and junior foods 0.2 ppm.

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Sm: Skeletal muscle

APPENDIX I: 1995 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
CHC/COP'S, continued						
Phosalone	40 CFR 180.263	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	-	0.25F 0.25M 0.25Mb
HALOFUGINONE	21 CFR 556.308	-	-	-	0.16L[1] 0.13L[1]	-
IVERMECTIN	21 CFR 556.344	100L[2]	30L[3]	20L[4]	-	
LEVAMISOLE	21 CFR 556.350	0.1Et	0.1Et[5]	0.1Et	-	

1 Broiler chickens and turkeys respectively; tolerance for parent halofuginone; corresponds to 0.3 ppm total residues in liver.
2 Tolerance in ppb for 22,23-dihydroavermectin B1a; corresponds to 240 ppb total residues in liver.
3 Sheep only; tolerance in ppb for 22,23-dihydroavermectin B1a.; corresponds to 125 ppb total residues in liver.
4 Tolerance in ppb for 22,23-dihydroavermectin B1a ; corresponds to 75 ppb total residues in liver.
5 Sheep only.

KEY

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K: Kidney
L: Liver
M: Muscle
Mb: Meat byproducts
S: Skin
Sf: Skin with fat
Sm: Skeletal muscle

APPENDIX II

1995 DOMESTIC RESIDUE PROGRAM RESULTS

NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

APPENDIX II: 1995 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

ANTIBIOTICS

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Bulls	377/0	
Beef cows	530/0	
Dairy cows	509/0	
Heifers	288/0	
Steers	300/0	
Bob calves	479/1	
Formula-fed calves	514/9	
Non-formula calves	404/1	
Heavy calves	450/1	
Cattle		390/3
Sheep	447/0	
Lambs	583/1	
Sheep/Lambs		78/0
Goats	279/0	
Market hogs	325/3	
Boars/Stags	394/0	
Sows	521/1	
Swine		236/12
Young chickens	494/1	
Mature chickens	527/0	
Chickens		10/0
Young turkeys	502/4	
Mature turkeys	232/2	
Turkeys		21/1
Ducks	500/2	11/0
Geese	32/0	

APPENDIX II: 1995 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

SULFONAMIDES

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Bulls	374/2	
Beef cows	517/1	
Dairy cows	478/0	
Heifers	359/1	
Steers	324/0	
Bob calves	547/3	
Formula-fed calves	526/4	
Non-formula calves	418/11	
Heavy calves	463/2	
Cattle		49/2
Sheep	274/0	
Lambs	352/0	
Sheep/Lambs		12/0
Goats	280/0	
Market hogs	310/2	
Boars/Stags	377/8	
Sows	514/1	
Swine		66/7
Young chickens	482/4	
Mature chickens	518/1	
Chickens		14/0
Young turkeys	530/5	
Mature turkeys	231/3	
Turkeys		32/2
Ducks	530/0	1/0
Geese	31/0	

APPENDIX II: 1995 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

ARSENIC

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Horses		2/0
Market hogs	112/11	
Boars/Stags	72/4	
Sows	103/8	
Young chickens	488/396	
Mature chickens	113/17	
Chickens		23/9
Young turkeys	310/79	
Mature turkeys	36/5	
Turkeys		24/1
Ducks	89/0	

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Horses	507/57	180/0
Bulls	578/80	
Beef cows	520/67	
Dairy cows	522/80	
Heifers	569/38	
Steers	526/29	
Bob calves	501/102	
Formula-fed calves	521/7	
Non-formula calves	410/45	
Heavy calves	453/123	
Cattle		736/214
Sheep	453/79	

APPENDIX II: 1995 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

CHC/COP'S, continued

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Lambs	600/91	
Sheep/Lambs		5/0
Goats	464/51	33/11
Market hogs	524/15	
Boars/Stags	410/44	
Sows	549/42	
Swine		103/0
Young chickens	487/6	
Mature chickens	536/12	
Chickens		110/3
Young turkeys	528/25	
Mature turkeys	266/22	
Turkeys		8/0
Ducks	505/4	
Geese	33/4	

HALOFUGINONE

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Young chickens	470/3	17/0
Young turkeys	322/0	

APPENDIX II: 1995 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

IVERMECTIN

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Bulls	365/7	
Beef cows	316/1	
Dairy cows	328/1	
Heifers	320/0	
Steers	512/0	
Formula-fed calves	221/4	
Non-formula calves	180/2	
Heavy calves	445/3	
Cattle		28/0
Sheep	449/1	
Lambs	210/0	
Sheep/Lambs		15/0
Goats	212/0	30/0
Market hogs	113/0	
Boars/Stags	72/0	
Sows	104/0	
Swine		1/0

APPENDIX II: 1995 DOMESTIC RESIDUE PROGRAM RESULTS: NON-VIOLATIVE LABORATORY CONFIRMED POSITIVE RESULTS

LEVAMISOLE

Slaughter class	Monitoring: Analyses/Positives	Enforcement Testing: Analyses/Positives
Bulls	349/0	
Beef cows	311/1	
Dairy cows	292/0	
Heifers	318/0	
Steers	309/0	
Formula-fed calves	321/0	
Non-formula calves	252/0	
Heavy calves	273/0	
Sheep	430/0	
Lambs	347/1	
Sheep/Lambs		20/0
Goats	277/0	
Market hogs	476/0	
Boars/Stags	232/0	
Sows	312/0	

APPENDIX III

APPENDIX III. 1995 VOLUNTARY INSPECTION AND CERTIFICATION PROGRAM FOR RABBITS

Monitoring:	Analyses/ Violations	Analyses/ Non-violative Positives
Antibiotics	69/1	69/4
Sulfonamides	73/0	73/0
CHC/COP'S	66/1	66/2

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

1 streptomycin
1 chlorpyrifos